

Grade 6

FCAT 2.0 Mathematics

Sample Answers

This booklet contains the answers to the FCAT 2.0 Mathematics sample questions, as well as explanations for the answers. It also gives the Next Generation Sunshine State Standards (NGSSS) benchmark assessed by each item. Although the Florida State Board of Education adopted the Common Core State Standards in the summer of 2010, these standards have not yet been implemented. For this reason, the 2012 FCAT 2.0 tests and sample questions and answers are based on the 2007 NGSSS. The benchmarks included in this booklet provide teachers with additional information. For more detailed information, follow this link to the Florida NGSSS website: <http://www.floridastandards.org/index.aspx>, or follow this link to the current benchmark language in the *FCAT 2.0 Mathematics Test Item Specifications*: <http://fcat.fldoe.org/fcat2/itemspecs.asp>.

In addition, one or more possible approaches to solving the questions are provided. Students may use approaches other than these and still receive credit if they also obtain a correct answer.

Multiple-choice and gridded-response items in FCAT 2.0 Mathematics tests are scored by awarding one point for each correct answer.

The intent of these sample test materials is to orient teachers and students to the types of questions on FCAT 2.0 tests. By using these materials, students will become familiar with the types of items and response formats they will see on the actual test. The sample questions and answers are not intended to demonstrate the length of the actual test, nor should student responses be used as an indicator of student performance on the actual test. Additional information about test items can be found in the *FCAT 2.0 Test Item Specifications* at <http://fcat.fldoe.org/fcat2/itemspecs.asp>.

The sample questions for students and the sample answers for teachers will only be available online, at <http://fcat.fldoe.org/fcat2/fcatitem.asp>.

1 The correct answer is D, as shown below.

Reporting Category: Expressions and Equations

Benchmark: MA.6.A.3.2 Write, solve, and graph one- and two- step linear equations and inequalities. Also assesses MA.6.A.3.4 Solve problems given a formula.

To find the correct number line that represents the solution, first solve the inequality.

To solve $3x < 15$, divide both sides by 3.

$$3x \div 3 < 15 \div 3$$

$$x < 5$$

Because $x < 5$, 5 is not part of the solution; therefore, the number line must have an open circle at 5. Both options A and C are incorrect because they have closed circles at 5.

Option B is incorrect because it represents values greater than 5.

The correct answer is D, which represents values less than 5 and does not include 5.

2 The correct answer is G (commutative property).

Reporting Category: Expressions and Equations

Benchmark: MA.6.A.3.5 Apply the Commutative, Associative, and Distributive Properties to show that two expressions are equivalent.

To move from Step 1 to Step 2, the commutative property is used, as the order of the two addends, 12.35 and 1.59, is reversed. The associative property is used to move from Step 2 to Step 3, as the three addends are grouped differently. Addition is used to move from Step 3 to Step 4 and from Step 4 to Step 5, as the addends are combined.

3 The correct answer is A $\left(\frac{1}{10}, 16\%, 0.2, \frac{1}{4}, 0.29\right)$.

Reporting Category: Fractions, Ratios/Proportional Relationships, and Statistics

Benchmark: MA.6.A.5.2 Compare and order fractions, decimals, and percents, including finding their approximate location on a number line.

To solve this problem, the five numbers displayed for the foods may be converted to the same numerical form. The equivalent representations may be fractions, decimals, or percents. Once the five numbers have been converted, they can be ordered from least to greatest. The result of this process is shown in the following table.

	Chicken 0.29	Cole slaw 0.2	French fries $\frac{1}{4}$	Juice $\frac{1}{10}$	Cookie 16%
Fraction	$\frac{29}{100}$	$\frac{20}{100}$	$\frac{25}{100}$	$\frac{10}{100}$	$\frac{16}{100}$
Decimal	0.29	0.20	0.25	0.10	0.16
Percent	29%	20%	25%	10%	16%

Another strategy involves understanding fractions with equivalent numerators, i.e., because tenths are smaller than fourths, $\frac{1}{10}$ is less than $\frac{1}{4}$. By using the process of elimination, options B and D are incorrect because $\frac{1}{4}$ is listed before $\frac{1}{10}$ in these options. Option C can be eliminated because $0.29 > 0.2$ (0.20), and 0.29 is listed before 0.2. Option A is correct.

4 The correct answer is 350.



Reporting Category: Fractions, Ratios/Proportional Relationships, and Statistics

Benchmark: MA.6.A.5.1 Use equivalent forms of fractions, decimals, and percents to solve problems.

To find the number of votes that were for the third commercial, first find the number of votes that the first two commercials received.

To find 25% of 1,000, change 25% to $\frac{1}{4}$. Then multiply 1,000 by $\frac{1}{4}$. ($1,000 \times \frac{1}{4} = 250$)

To find $\frac{2}{5}$ of 1,000, multiply 1,000 by $\frac{2}{5}$. ($1,000 \times \frac{2}{5} = 400$)

Because the third commercial received the remaining votes, subtract the sum of 250 and 400 from 1,000.

$$1,000 - (250 + 400)$$

$$1,000 - 650$$

$$350$$

				3	5	0
	/	/	/	/	/	
•	•	•	•	•	•	•
0	0	0	0	0	0	•
1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	•	3	3	3
4	4	4	4	4	4	4
5	5	5	5	•	5	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
9	9	9	9	9	9	9

5 The correct answer is 50 inches.



Reporting Category: Geometry and Measurement

Benchmark: MA.6.G.4.3 Determine a missing dimension of a plane figure or prism given its area or volume and some of the dimensions, or determine the area or volume given the dimensions.

First Strategy:

To solve this problem, the trapezoid formula on the Grades 6–8 FCAT 2.0 Mathematics Reference Sheet can be used.

Use numbers from the diagram and the problem in the equation and solve for the unknown variable, as shown below.

$$A = \frac{1}{2}h(b_1 + b_2)$$

$$1,440 = \frac{1}{2}(32)(b_1 + 40)$$

$$1,440 = 16(b_1 + 40)$$

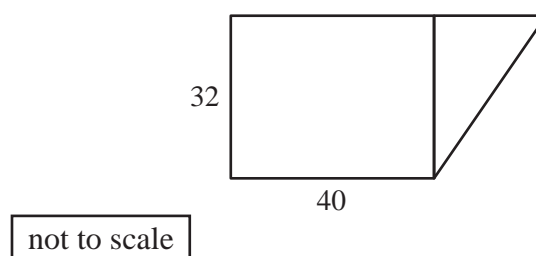
$$90 = b_1 + 40$$

$$50 = b_1$$

OR

Second Strategy:

To find the length of Tim's workbench, first divide the trapezoid into a rectangular section and a triangular section.



(continued on next page)

5 (continued)

Because the area of the workbench was given, find the area of the rectangular section ($32 \times 40 = 1,280$) and then subtract it from the trapezoidal area ($1,440 - 1,280 = 160$).

Using the formula for the area of a triangle, $A = \frac{1}{2}bh$, substitute 160 for the area of the triangle and 32 for the height of the triangle.

$$160 = \frac{1}{2}b(32)$$

Simplify the right side of the equation to $160 = 16b$.

Now, divide both sides by 16 to solve for b ; $b = 10$.

Because opposite sides of a rectangle are equal, the other side of the rectangular side is 40. To find the total length of the workbench, 40 and 10 must be added.

$40 + 10 = 50$, the total length of the workbench.

				50
	/	/	/	/
•	•	•	•	•
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

6 The correct answer is I (265).

Reporting Category: Fractions, Ratios/Proportional Relationships, and Statistics

Benchmark: MA.6.S.6.2 Select and analyze the measures of central tendency or variability to represent, describe, analyze, and/or summarize a data set for the purpose of answering questions appropriately.

Multiply 235 by 6 to find the desired sum of the 6 games, because 235 is the mean of the 6 games.

$$235 \times 6 = 1,410$$

Add the scores of the 5 games.

$$220 + 245 + 210 + 260 + 210 = 1,145$$

Subtract the sum of the 5 games from the desired sum of the 6 games.

$$1,410 - 1,145 = 265$$

7 The correct answer is B (25).

Reporting Category: Fractions, Ratios/Proportional Relationships, and Statistics

Benchmark: MA.6.S.6.1 Determine the measures of central tendency (mean, median, mode) and variability (range) for a given set of data.

The median is the middle number in an ordered list, or the sum of the two middle numbers divided by 2. In a line plot, the data are already in numerical order: 18, 19, 20, 25, 26, 28, 28. There is only one middle number, 25. This is the median and the correct answer.

8 The correct answer is G ($180x$).

Reporting Category: Expressions and Equations

Benchmark: MA.6.A.3.6 Construct and analyze tables, graphs, and equations to describe linear functions and other simple relations using both common language and algebraic notation.

To determine which expression represents the relationship between swimming hours and calories burned, analyze the pairs of numbers. First, look at the numbers that do not contain decimals, i.e., 1 and 180, and 2 and 360, to determine a pattern or relationship. Because the second column (the number of calories burned) is larger than the first column (number of hours swimming), either addition or multiplication was used. For example, either 179 was added to 1 ($1 + 179 = 180$), or 1 was multiplied by 180 ($1 \times 180 = 180$).

Next, determine which of these relationships is used in the other pairs of numbers. (Note that adding 179 to the other numbers in the first column does not result in the sums in the second column.) Multiply 180 by the other numbers in the first column to check if it is the correct relationship.

$$0.5 \times 180 = 90$$

$$1.5 \times 180 = 270$$

$$2 \times 180 = 360$$

Because multiplying each number in the first column (x) by 180 results in the number in the second column (y), $180x$ is the correct expression to find the number of calories burned after swimming x hours.

9 The correct answer is 285 square feet.



Reporting Category: Geometry and Measurement

Benchmark: MA.6.G.4.2 Find the perimeters and areas of composite two-dimensional figures, including non-rectangular figures (such as semicircles) using various strategies. Also assesses MA.6.A.3.4 Solve problems given a formula.

To find the total area to the nearest whole foot, the area of the rectangle and the area of the semicircle must be calculated and then added together.

Use the reference sheet for the area of a rectangle, $A = bh$, and the area of a circle, $A = \pi r^2$. Substitute the numbers from the diagram, and then solve for the areas.

$$A (\text{rectangle}) = 19 \times 12$$

$$A = 228$$

$$\text{Area (semicircle)} = \frac{1}{2} \pi r^2$$

$$\text{Using } \frac{22}{7} \text{ for } \pi, A (\text{semicircle}) = \frac{1}{2} \times \frac{22}{7} \times 6^2$$

$$A = \frac{11}{7} \times 36$$

$$A = 56.57$$

Now, add the two partial areas together ($228 + 56.57 = 284.57$).

Because the answer must be expressed to the nearest whole foot, the correct answer is rounded up to 285.

			2	8	5
	/	/	/	/	/
•	•	•	•	•	•
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

10 The correct answer is B (17).

Reporting Category: Fractions, Ratios/Proportional Relationships, and Statistics

Benchmark: MA.6.A.1.3 Solve real-world problems involving multiplication and division of fractions and decimals. Also assesses MA.6.A.1.2 Multiply and divide fractions and decimals efficiently.

Divide $25\frac{1}{2}$ by $1\frac{1}{2}$ to find how many $1\frac{1}{2}$ cups are in $25\frac{1}{2}$ cups.

$$25\frac{1}{2} \div 1\frac{1}{2} = \frac{51}{2} \div \frac{3}{2}, \text{ and } \frac{51}{2} \div \frac{3}{2} = \frac{51}{\frac{3}{2}}$$

To simplify the fraction, multiply the numerator and denominator by the multiplicative inverse of the fraction in the denominator. This results in a denominator of 1, which is the multiplicative identity. This results in the shortcut method commonly known as “invert and multiply.”

$$\frac{\frac{51}{2}}{\frac{3}{2}} \cdot \frac{\frac{2}{3}}{\frac{2}{3}} = \frac{51 \cdot \frac{2}{2}}{\frac{3}{1}}$$

To further simplify $\frac{51}{2} \cdot \frac{2}{3} = \frac{51}{3}$, or 17.

11 The correct answer is H ($6x + 2.50$).

Reporting Category: Expressions and Equations

Benchmark: MA.6.A.3.1 Write and evaluate mathematical expressions that correspond to given situations. Also assesses MA.6.A.3.3 Work backward with two-step function rules to undo expressions.

Because the total cost is dependent upon the variable x , the number of days the video recorder is rented, $6x$ represents the cost to rent the video recorder for x days at the price of 6 dollars per day.

Because the \$2.50 cleaning fee is a one-time fee, the value 2.50 is a constant that is added to the $6x$.

The correct expression is $6x + 2.50$.

12 The correct answer is A (15).

Reporting Category: Fractions, Ratios/Proportional Relationships, and Statistics

Benchmark: MA.6.A.2.1 Use reasoning about multiplication and division to solve ratio and rate problems.

To solve this problem, the rate of success for each player needs to be determined.

Karla's rate of success can be expressed as a fraction: $\frac{8}{24}$ or $\frac{1}{3}$.

Becky's rate of success can be expressed as a fraction: $\frac{5}{20}$ or $\frac{1}{4}$.

Because Karla will be successful in about $\frac{1}{3}$ of her 180 attempts, find $\frac{1}{3}$ of 180.

$$\frac{1}{3} \times 180 = 60$$

Because Becky will be successful in about $\frac{1}{4}$ of her 180 attempts, find $\frac{1}{4}$ of 180.

$$\frac{1}{4} \times 180 = 45$$

To find how much more successful Karla would be than Becky for 180 throws, subtract $60 - 45 = 15$.

The correct answer is 15.

13 The correct answer is I (34-Watt Cool White).

Reporting Category: Fractions, Ratios/Proportional Relationships, and Statistics

Benchmark: MA.6.A.2.2 Interpret and compare ratios and rates.

To determine the cost per light bulb for each type, first divide the total cost for each type of bulb by the quantity purchased.

10-Watt Clear	$\$ 14.85 \div 9 = \1.65
13-Watt Warm White	$\$119.40 \div 60 = \1.99
20-Watt Capsule Bulb	$\$ 10.74 \div 6 = \1.79
34-Watt Cool White	$\$147.60 \div 90 = \1.64

The 34-Watt Cool White costs the least per light bulb.

- 14** The correct answer is C (63.6 square meters).

Reporting Category: Geometry and Measurement

Benchmark: MA.6.G.4.1 Understand the concept of Pi, know common estimates of Pi (3.14 ; $\frac{22}{7}$) and use these values to estimate and calculate the circumference and the area of circles. Also assesses MA.6.A.3.4 Solve problems given a formula.

First strategy:

To find the area of a circle, use the formula $A = \pi r^2$ from the reference sheet.

If the diameter of the circle is 9 meters, the radius of the circle can be expressed as 4.5.

Using 3.14 as π , $A = 3.14(4.5)^2$

$3.14(20.25) = 63.585$, which is closest to 63.6

OR

Second strategy:

Use the formula for area, and express the radius and π as fractions:

$$A = \frac{22}{7} \cdot \frac{9}{2} \cdot \frac{9}{2}$$

$$\frac{11 \cdot 9 \cdot 9}{7 \cdot 2} = \frac{891}{14}, \text{ which is closest to } 63.6$$

The correct answer is 63.6 square meters.

15 The correct answer is G (multiply $\frac{1}{2}$ by 50).

Reporting Category: Fractions, Ratios/Proportional Relationships, and Statistics

Benchmark: MA.6.A.5.3 Estimate the results of computations with fractions, decimals, and percents, and judge the reasonableness of the results.

First strategy:

Because the fractions in the problem can be easily converted to percents, percents can be used to find an estimate of his time.

$\frac{1}{5}$ is 20% and $\frac{1}{3}$ is close to 33%.

Mr. Madsen spent about 20% + 33%, or about 53% of his time in meetings and on the phone with customers.

53% is close to 50% or $\frac{1}{2}$. Because 49 hours is close to 50 hours, the most reasonable estimation method would be to multiply $\frac{1}{2}$ by 50.

OR

Second strategy:

To solve this problem, the sum of the fractions $\frac{1}{5}$ and $\frac{1}{3}$ can be estimated to be about $\frac{1}{2}$.

$$\frac{1}{5} = \frac{3}{15} \text{ and } \frac{1}{3} = \frac{5}{15}$$

$$\frac{3}{15} + \frac{5}{15} = \frac{8}{15}, \text{ which is close to } \frac{1}{2}$$

Because 49 hours is close to 50 hours, the most reasonable estimate would be to multiply $\frac{1}{2}$ by 50.

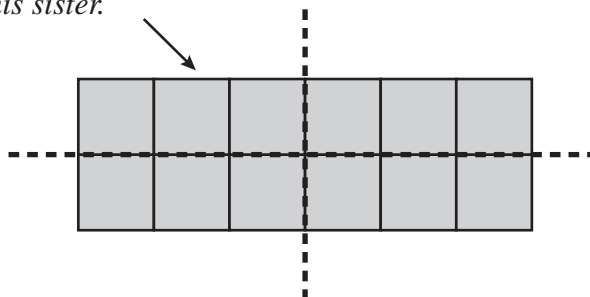
16 The correct answer is **B**, as shown below.

Reporting Category: Fractions, Ratios/Proportional Relationships, and Statistics

Benchmark: MA.6.A.1.1 Explain and justify procedures for multiplying and dividing fractions and decimals.

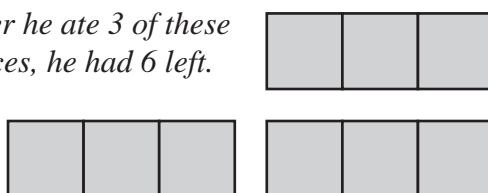
Because Akeem gave his sister $\frac{1}{4}$ of the chocolate bar, divide the chocolate bar into 4 equal parts, as shown below. After dividing the bar into 4 equal parts, remove $\frac{1}{4}$ of the bar (or the 3 pieces) that he gave his sister.

He gave these 3 pieces to his sister.



Now, divide the remaining part of the bar into 3 equal parts. If he ate $\frac{1}{3}$ of the remaining 9 pieces, he has 6 pieces left.

After he ate 3 of these pieces, he had 6 left.





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